Architecture and the Problems of Science, Technology and Art

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Abstract

Design requires its own specialized knowledge; it makes new and considerably greater demands on the social sciences and humanities. It encourages science to develop. The problem of the interaction between science and art is a philosophical one. For that reason we want to explain how science affects the architect. Although an architect knows that science and art are both the results of the creative process, it is necessary to emphasize what the scope of the problems connected with this interaction depends on, and the social and cultural environment in which it exists. This is despite that scientific and technological progress sometimes leads to a deterioration of the aesthetic state of the architect's way of design.

Introduction

The architect is specialized more in the problems of architecture rather than the sciences. This is true of the philosophical, socio-ethical and humanist foundations of scientific knowledge as well. In a certain sense the problems arising stand outside any concrete time. They are eternal problems in mankind's spiritual development from ancient times. That is a common tradition in the humanist culture of mankind, providing solutions to the socio-ethical and moral humanist values. However in this sphere too, an orientation is possible towards objective values, the search for the truth which manifests its significance in its technological applications. Science as a form of human activity aspires towards a reunion with man. Science encroaches not only in the social but also on the private life of man. The demand to take into account human traits and to conform to certain rules modifies even traditional instruments of cognition. This makes science more dependent on society, becoming personality-oriented in character.

This interpretation of the philosophical and the social establishes links between science, man and society. Value is a form of manifestation of the relation between subject and object in which the properties of the object are appraised in terms of their ability to satisfy the needs of the subject. Immanuel Kant remarked that "the agreeable is what gratifies a man, the beautiful what simply pleases him, the good what is esteemed." Since the needs of the social subject is produced by the architect, enabling man to orientate himself freely in the building transforms into a process of creative activity. The architect knows how to apply the inherent standard to the object, therefore he forms things in accordance with the laws of beauty. Thus the architect places scientific

cognition in a subject–object relation and includes it in the sphere of methodological analysis, during which the correspondence between knowledge and reality is established.

What is truth in architecture?

What is truth in architecture? Hegel spoke about the courage of truth seeking. The courage of cognition laid before his eyes its wealth and its depths. Cognition and values are organically interconnected here since both are expressed by the architect's creative and active essence when certain decisions deviate from ethical humanist norms. The architect is taking account of past experiences, and critically correlating them with the present to avoid repetition of what has already been discarded in the history of architecture. The architect achieves progress in the formation and solution of new architectural problems. In turning to socio-ethical and humanist problem in architecture today, the architect defines not only the polarization of scientism but also the scientific pseudo-scientism of this approach as well as utopian optimism for the future of architecture and human civilization in order to learn to think in a new way, linking up past and future, asserting scientific creative freedom and accountability to the truth and to man, and promote science and creativity in architecture design.

Pythagoras believed in antiquity that the world was a harmony of numbers. Democritus saw the world as movement of atoms in a vacuum. Aristotle conceived it as a living organism. Throughout the history of architecture, attempts were undertaken to construct this kind of integral designs based on a small set of fundamental principles that is continuing to this day. Nowadays in the 21st Century the attempts are to build an integral physical structure on the basis of electrodynamics to evolve an integral picture of the world, to develop universal probabilistic and quantum ideas on the assumption that a unified theory of all fundamental interactions is feasible.

Science today embraces an immense variety of methods of cognition and methodological research programs. The properties of any complex structure and the laws of its functioning are fully determined by the laws of the constituent parts. It is organized in such a way that it rests on a certain fundamental theory. The development offers increasing possibilities for synthesizing knowledge obtained from science. A brick house is a realization of the laws of its constituent elements, the bricks and mortar, and it is not enough to know the properties of the building materials. The architect must have a blueprint for the house, which is determined by its mode of functioning as a whole and thus by its future functions. This blueprint takes into consideration the possibilities of the building material, but the drawing up of such plan is conditioned by laws of quite a different level of reality. Similarly one's behavior is connected with his natural and social qualities as an individual, and by the system of social relations in which he is involved. Any living person is determined by his/her relation with the population around him/her. This is obvious in humanist knowledge, where the meaning of any concept is determined by its context.

Sense Experience

Energy input in man is determined by the nature of his culture in which he lives. The supply of his food is conditioned by the technology of agricultural production. Man's interactions are

influenced by socio-cultural factors. The impact of solar energy on his body conditions his behavior and the modes of his life activity. Architecture by virtue of its actual limitations can exploit our capacity for dramatizing ourselves for heightening the action of ordinary life. Thus architecture is at once a developed art with functions dictated by expediency, economics and statics. Once we remove architecture from the arena of the solid and material, we remove the weightiest and most obvious restrictions on imaginative flight. Every architect desires to achieve finality in his own work, and in the same time look at humanity, at the environment, and find ways of reconciling the two. Reconciliation is a matter of deciding what level of misfit is appropriate, and to do so with technical skills, according to the weight of his social conscience. However, some of our architects have replaced what used to be good vernacular building with the most sophisticated kinds of the 21st century architecture because our needs as human beings have changed. While for the future it should be based, not on current practice but on appropriate research including feedback studies of buildings in use, their successes, and their failures.

The architect holds that the sole source of his knowledge of things external to him is sense experience and how his knowledge is derived from the impressions made upon his various sense organs to distinguish between the primary and secondary qualities of physical objects for primary qualities are intrinsic characteristics of the object itself, characteristics such as solidity, extension in space and shape. Secondary qualities such as qualities as color, sound and temperature. Which exist only when actually sensed in the mind of the architect who senses them? The ideas that result from his perception of primary qualities are different from his ideas of secondary qualities. In contrast, when he perceives a secondary quality his idea of this quantity has no resemblance to a corresponding property of the thing itself, because material objects are the causes of the ideas or appearances, or sense data he has of them. The material substance itself is distinct from its own qualities, even from its own primary qualities, and, not being directly perceivable since all ideas are derived from experience. Physical objects, insofar as we have any clear idea of them at all are simply collections of sense impressions.

The Role of the Architect

Most of the problems concerning relationships between people and buildings between users and architects, concerning public participation, are raised by examples such as this. What used to be a simple building put together by people for themselves, has been replaced by architecture. The conflict is so much so between the architects and the users as that between housing on the ground and high rise blocks. And this led to the large scale building of quite unnecessary roads. This illustrates how dreary human habitation became. Much of the world is littered by buildings like these. That is why architects and planners have alienated themselves from the rest of the community. Architects offered ideas which are what the people expect, because people simply do not know what is possible. People might think like designers, but that depends on the survival of folk experience and traditions which simply have been broken down in countries since the Industrial Revolution. Almost all the solutions which are now being posed involve how to

improve the standard of environmental design – public participation itself, design for growth and change, design for energy conservation, and even a return to the vernacular.

However the architect's job is to look at humanity, to look at the environment in which humanity finds itself, to satisfy the needs of people and the environment through the medium of making buildings which may appear to people otherwise than as they really are as the architect expected, because what the people perceived is dependent for their existence on the state of the people's nervous system, and their sense-datum. This proves that we never come near to perceiving buildings as they really are. However buildings are indeed perceived but only indirectly by our sense-datum and what we directly see is something else. This should drive us, without further argument, into putting up a screen of sense-data between ourselves and the physical world. This means that illusions are possible. It is always sense-data that are directly perceived. Visual and tactual sense-data are parts of the surfaces of physical objects. The appearance of the whole frontage of a house may be treated as one sense-datum, or it may be divided into almost any number. The question is what is to count as a single feature. The correct reply may, therefore, be that this question does not admit of a definite answer, any more than there is a definite answer to the question how many parts a thing can have, or how much it can change without altering its identity. This is a matter of psychology rather than logic.

Aesthetic Ability

Although the architect has the ability for an aesthetical attitude to reality and for a perception of the beauty of the surrounding edifices, still this aesthetic ability needs to be shaped and developed. The feeling of beauty rose above the purely utilitarian pragmatic attitude to buildings and phenomena of reality, to products of human creativity. In this case the architect must take a comparatively free attitude to an object of phenomenon, taking stock of the laws of their existence: regularity, expediency, proportionality, unity of form and content, commensurability, symmetry, harmony, and other types of objectivities, and use his knowledge for purposes of change in his environment, which in the final analysis enhances man's power over nature to afford him a positive emotional reaction. The joy of knowledge and the feeling of freedom help to form aesthetic ability in the course of evolution. Man's feeling for beauty engenders in him a need for beauty. Thus commensurability, proportionality, perfection, and harmony of the phenomena of reality constitute the objective material basis of the beautiful. Therefore, the presence of objective foundations and laws of beauty should not be confused with their perception, evaluation and utilization by man in his activities. A work of art is beautiful if it represents a truthful reflection of reality, and a significant content is expressed in an adequate form.

Creativity is the new that each person introduces into reality and into this life on the basis of a sensuous and rational discursive cognition of the world, at the same time creation can and should be humanist. Thus aesthetic creation is the distinctive reproduction and creation of material and spiritual values reproduced by the architect and is solved by action, for which he bears responsibility. The architect creates history and answers for it. For Kant, concepts and

contemplation are only united in the process of cognition; their combination is cognition. For Hegel, there is no gap from between concept and contemplation; concepts are not empty, on the contrary, they are fulfilled and overflow, phenomena are not blind, they throw light on and even radiate the truth.

Science is a world of reason and abstract theoretical thought, while art is a world of images, feelings, impressions, imagination, and fantasy. In comparing art and reality, aesthetics is faced with the problem of complexity, specific to the sensuous tangible world of art. Equating objective and artistic reality cannot lead to an objective interpretation of the content of the work of art, for both impoverish the nature of artistic reactivity, which includes rational thought as a factor in the active transformation of the material into the ideal and in art's functional nature. Ideas in a work of art appear on the image-meaning and semi-logical level, and the expressive and axiological level. Aesthetic impressions from nature are extremely abundant in art today, which is packed with ideas, but such impressions are needed for their loftiness and beauty. The architect thinks in historical, moral and aesthetic terms.

Architecture and Social Consciousness

Today architecture is threatened by a situation in which the depiction or ready-made ideas in designs, tempting in its facility, may make architecture primitive. However, architecture intellectual influence is irreplaceable by any other force external to the act of individual perception. Only in this specific way does architecture become a link, an element, a source, and a factor in the development of progressive social consciousness. The interaction and mutual influence of science and art does not stop at ascertaining the epistemological and spiritual peculiarities of conceptual and artistic assimilation of reality, but goes on to find ways interpenetrating and complementing one another in order to shape a modern type of thinking which oriented the process of shaping the architect's mind to dissociation from historical realities and to his isolation within a shell of artistic images.

It might be said that philosophical systems of the past, suffice to remember Plato, and Kant's and Hegel's system of views, were only equivalent structural elements of their world outlook, in which they set out their teaching on nature, on the social essence and functions of architecture in its qualitative aesthetic concreteness as man's social ability to transform the world. This social ability is constrained by the surrounding world that justifies it, that is, in conformity with the laws of aesthetics, leaving each architect sufficient leisure so that what is really worth preserving in historically inherited culture, science, and art forms disclose the laws of beauty. The work of design then becomes a free play of physical and intellectual forces including the aesthetic principles into various spheres of architecture activities.

Leonardo Da Vinci

In this respect Leonardo da Vinci phenomenon expresses not the man of the past nor the man of the present, but rather the architect of the future by letting the historical culture disappear and only keeping the main achievements of antique culture and including them in his designs,

focusing attention not on the study of nature, but of human culture. Leonardo preferred the study of beauty. He was close to the philosophy of illusionism by saying "Man is the measure of all things". Leonardo also regarded mathematics as a science of a universal nature, and believed that no science could be regarded without a mathematical basis to be able to understand beauty and harmony, which are based on proportions, measurements and numbers which the architect must adhere to that. Leonardo fought, defending with all his might the rights of the beauty of the existing world, the rights of full-blooded art linked with nature, reality and life. Leonardo was in favor of science and art.

According to Plato the epistemological invalidity of the imitative arts is supplemented by their moral invalidity, because these forms of art create works of a false content and do not correspond to the truth, from the moral viewpoint they are capable only of corrupting citizens, of depriving them of civic and human virtues, and only as a negative and destructive force, and an imitation of an imitation which cannot lead to truth.

Leonardo's views are, Platonism turned upside down. Leonardo replaces Plato's super-sensuous world of ideas with the real world, nature. He replaces the search for other worldly comprehensible objects with a study of the laws, qualities and forms of existing nature, investigations into the spiritual life and structure of man, whereas Plato focused on a study of the beautiful. Unlike Plato, Aristotle proclaimed the autonomy of art. This was bound to please Leonardo, for he could not conceive of art without freedom.

Leonardo da Vinci seems to restore to human sight and the human eye their lawful place, whereas Plato turned vision and the eyes away from the visible, sensuous and natural, the real world in the direction of the unreal, supernatural, super-sensuous and invisible world in order to contemplate the world of essences, the world of the *eidos*, Leonardo restores to human sight and the human eye their lawful place, their natural functions and sphere.

Science, Technology, Art and Architecture

The history of the last two centuries has seen an increasing division and separation of science, art and technology, due to increased specialization, because progress demands specialization. In this context functionalism came into being and formulated its demands, and from it originated the ideology and conception of the Bauhaus. The development of design led to the cooperation between the engineer and the architect and later the scientist.

Criticism of the existing forms of the man-made environment and the creations of new designs for buildings prompted the need for change in existing methods of designing and manufacturing to satisfy man's material and cultural demands with respect to both utilitarian and aesthetic needs. This boosted the development of designs throughout the world.

The development of the man-made environment is planned using the systems approach, and this involves setting up a system of ideals, defining the possible trends and prospects for the development of man's activity, and creating on this basis the optimal variety of objects which will

surround man in his home, on the street and at his place of work. Here, it is precisely in the field of design that a new and higher form of creativity, the formation of new material and cultural values, will embrace the means and objectives of science, technology and art. This will open up unlimited possibilities for the development of science, technology and architecture. Architecture will be an organic part of this process, and designs will provide the physical environment for life, labor and leisure.

Since the introduction of prefabricated construction architecture has of necessity overlapped the field of design with the field of mass industrial production. The activities that take place in buildings and the objects involved in organizing such activities will predetermine the character and structure of their material outer shell. Considering the work of the designer we can no longer ask if he is an engineer or an architect, and whether he is an artist or a scientist. It will be a collective work that forms a single creative effort. Design requires its own specialized knowledge; it makes new and considerably greater demands on the social sciences and humanities. It encourages science to develop.

Artistic Image and Self-Awareness

Architecture begins and ends with a beautiful image including many questions concerning their function in the society. The nature of the artistic image of the building cannot be understood without clarifying the problem of philosophy that deals with the relation of consciousness and being, of spirit and matter with its specifically sensory manifestations. This principle has the force of a law in architecture and reveals the idea sources of artistic imagery. Architecture does not directly mirror the world of human relations and needs, but does so in extremely stylized volumes and spaces, changes nothing in principle, since the spiritual reflection of people's mode of life is given expression in symbolic, objectively sensory artistic imagery. The use of imagery in the creative process is essential if architecture is to flourish.

The disclosure of the dialectical relations and transitions between the subjective and objective is that the subjective and objective is fixed in ideal images comprehended by the subject as a result of mastering one given aspect of reality. In its inner activity, consciousness separates these images from their objectively existing prototypes, finding them in itself and using them as its own images. The consciousness contemplation of these images pursues the goal of establishing their true essence, of correlating an image's individual personal meaning and its objective meaning. The architect is focusing on the aesthetic level of consciousness, emphasizing behavior, and establishing links between the parts and the whole in the memory, recording social and aesthetic experience for the formation of the architecture conception, to establish links in it so as to attain a material form of existence.

Visual imagery then emerges which makes the act of self-awareness, with its results, tangible and precise. The architect may adopt the role of critic or theoretician in the process with regard to his design. The aesthetic quality is inherent in his emotions to the degree that they express his cognitive ability, for there has never been any architect's search for truth without emotions, on

which the cognitive abilities of emotions fully depend. Emotions provide general ideas about the design, which reflect its quality not as such, but in the meaning in people's lives, because emotions have an innate tendency to merge with the design, they do not separate subject from object, a quality so clearly expressed in consciousness, thus filling them with objective content. Whatever the original feelings they always awaken feeling, the function of which is to demand knowledge which is found in the realm of psychology to explain the relation between consciousness and emotions.

As a result the work of architecture becomes an intimate emotional experience on the social level. To imagine this outside the self-awareness process of the design of artistic creativity is impossible. Individual self-awareness can be possible when the architectural design is not opposed to itself, but a purposeful split in the consciousness between its objective and subjective content with the accent on the former takes place, eliminating contradictions of idea and content and finding better means for the transition and embodiment of a new unity in order to establish the true relations between the essence of subjectivity. Architecture designs from the memory are often too general to become the sole material for architectural design, which strives towards maximum sensory tangibility in design depiction. Designs from the past in the memory are strongly reduced, and in time they become effaced. This is also true of imagination deprived of contact with reality; it cannot make its designs as full-fledged and vivid as they must be in art and architecture.

Today it is impossible to comprehend the entire range of changes that have occurred. The problem of the interaction between science and art is a philosophical one. For that reason we want to explain how science affects the architect although an architect knows that science and art are both the results of the creative process, so it is necessary to emphasize what the scope of the problems connected with this interaction depends on, and the social and cultural environment in which it exists. Although this scientific and technological progress sometimes leads to a deterioration of the aesthetic state of the architect's way of design, this scientific technological revolution caused aesthetic achievement to be impossible in an industrialized society and raised the call for a back-to-nature movement. This led the architect to believe that scientific consciousness would mean the end of aesthetics in architecture instead of perceiving aesthetics scientifically and reviving architecture creativity.

Externalists and Internalists

Western philosophers said that this could lead to the formation of two independent cultures, the scientific and the artistic, but the externalists see the reason for scientific progress in the influence of external factors, including aesthetic ones, while the internalists claim that it develops strictly in accordance with its own natural laws, inherent in the evolution of scientific knowledge. History has shown that it is in art that free creative individuality took shape and asserted itself and, for this, art came forth as that form of activity and cognition which stimulated the creative potentials of the architect. Architecture then will be able to act as a moral regulator, reflecting the society's attitude to the architect and evaluate the significance of his design.

Modern technology has led to re-evaluation of past cultural values including aesthetic ones and to the formation of new values based on contemporary systems-forming principles which were an outgrowth of the scientific and technological equipping of culture, which have led to the lowering of the architect's active perception and lessened his ability to perceive architecture creatively. As a result, 21st century architect found himself in a difficult situation in which he is brought up on many cultural and artistic traditions of the past, and at the same time is strongly influenced by the achievement of modern society which do not harmonize with traditional cultural values of the past.

This led the modern architect to devaluate many aspects of those cultures in his eyes. He finds it hard to perceive the beauty of old castles. This is a natural phenomenon in cultural history. Now architecture seeks new methods and forms far removed from traditional ones. This called for a large extent of scientific and technological progress by a change in modern architect's perceptions, a movement toward orienting forms of artistic culture on mass psychology and controlling it, resulting in the lowering of art's spiritual content, a tendency in the modern arts to use the latest technological achievements and to create new artistic language, based on a synthesis of the representational and expressive means of traditional architecture, and a union of works of art with nature which would combine functional and utilitarian principles with aesthetic and artistic ones.

To solve this problem the modern architect tried to organize an aesthetic environment by means of very different architectural forms which led to the disappearance of the boundaries between the traditional forms of architecture and architecture for aesthetic contemplation. The problem is that every culture possesses its own unique cultural language. To perceive the general spiritual values of past cultures can be by means of the emotional and aesthetic influence the professors of architecture have on their students. Thus the scientific-informational capacity is possible to transmit information that is more integrally assimilated by the students of architecture. All the efforts of culture, science, technology and art should be concentrated on attaining this goal.

Conclusion

Cognitive activity is part and parcel of architectural creativity. The development of the cognitive function of architectural creativity directly depends on the historically conditional status of architecture as a relatively independent form of spiritual production and social consciousness. The cognitive function of architecture is further developed in an organic unity with its other functions, the ideological, educational, moral and others. It is also further developed when the practical applications and authority of science are implicated. The architecture design succeeds if these four stages are realized 1) general cognition and perception of reality 2) emergence of the initial concept 3) selective cognition and perception of reality 4) direct execution of the project. The architect's reflection of reality is a creative not a mechanical act.

The difficulties that arise when attempting to objectively appraise the architect's own psychological state make one very cautious in referring to a concept, and the theory of creative

activity turns into an account of the architect's personal life, an attempt to recapture sensations and feelings once experienced by the architect.

Selective knowledge and perceptions of reality and a grasp of material properties enable the architect to embody his initial idea in the design. Aesthetics give qualitatively definite characters in a given age, country and people, and determines its basic features and trends which are integrated in the culture in question as a phenomenon of aesthetics and architecture. That means an understanding of the complexities and contradictions of the specific developments in the history of aesthetics and their theoretical and artistic expression. The conflict and dialectic unity of tradition and innovation, profoundly reveal the idea of the development of aesthetic consciousness and realism.

Assimilating the aesthetic heritage today means taking account of the complex interaction and conflict between different opposing trends, theories and ideas in aesthetics and architecture. As a result, the aesthetic tradition establishes itself in a given culture. Every form of innovation in architecture and aesthetic theory is correlated with tradition in a positive or negative manner.